

IN THE CLAIMS:

1. (Original) A heating device comprising:
a heating body;
a power source for supplying a current to said heating body;
a current control element controlling current flowing through said heating body; and
a heat conductive body to be thermally coupled with said heating body and said current control element for transmitting heat generated by said heating body and heat generated by said current control element to a heating object.

2. (Currently amended) A drive method for an engine branching an intake air to be supplied to a collector across an air adjusting valve into a plurality of intake air passage in an intake manifold for supplying into each engine cylinder, injecting fuel into intake air flow for driving the engine, the method comprising steps of:

injecting fuel into an air flow to be supplied to said collector for forming an air/fuel mixture;

heating said air/fuel mixture by said heating device according to claim 1 within said collector; and

introducing heated air/fuel mixture into each engine cylinder of the engine.

3. (Currently amended) A drive method for an engine branching an intake air to be supplied to a collector across an air adjusting valve into a

plurality of intake air passage in an intake manifold for supplying into each engine cylinder, injecting fuel into intake air flow for driving the engine, and detecting oxygen concentration in an exhaust gas by means of an oxygen sensor, the method comprising steps of:

injecting fuel into an air flow to be supplied to said collector for forming an air/fuel mixture;

heating said air/fuel mixture by said heating device according to claim 1 within said collector;

introducing heated air/fuel mixture into each engine cylinder of the engine; and

detecting oxygen concentration in the exhaust gas with heating said oxygen sensor.

4. (Currently amended) An engine driving system branching an intake air to be supplied to a collector across an air adjusting valve into a plurality of intake air passage in an intake manifold for supplying into each engine cylinder, injecting fuel into intake air flow for driving the engine, the system comprising:

at least one fuel injector provided in said collector for injecting fuel into said collector for forming an air/fuel mixture; and

a heating device according to claim 1 provided in said collector for heating said air/fuel mixture within said collector.

5. (Currently amended) An engine driving system branching an intake air to be supplied to a collector across an air adjusting valve into a plurality of intake air passage in an intake manifold for supplying into each engine cylinder, injecting fuel into intake air flow for driving the engine, the system comprising:

at least one fuel injector provided in said collector for injecting fuel into said collector for forming an air/fuel mixture;

a heating device according to claim 1 provided in said collector for heating said air/fuel mixture within said collector; and

a current control element provided in said collector for controlling current to be supplied to said heating device.

6. (Currently amended) An engine driving system branching an intake air to be supplied to a collector across an air adjusting valve into a plurality of intake air passage in an intake manifold for supplying into each engine cylinder, injecting fuel into intake air flow for driving the engine, and detecting oxygen concentration in an exhaust gas by means of an oxygen sensor, the system comprising:

at least one fuel injector provided in said collector for injecting fuel into said collector for forming an air/fuel mixture;

a first heating device according to claim 1 provided in said collector for heating said air/fuel mixture within said collector; and

a first current control element provided in said collector for controlling current to be supplied to said heating device;

a second heating device according to claim 1 provided in said oxygen sensor for heating a sensor element in said oxygen sensor; and

a second current control element provided in said oxygen sensor for controlling current to be supplied to said second heating device.

7. (Currently amended) An air intake module for an internal combustion engine comprising:

a collector;

a throttle valve assembly connected to said collector;

an intake manifold connected with said collector for introducing intake air into each engine cylinder;

a fuel injector provided in said collector for injecting fuel toward an intake air flow in said collector for forming an air/fuel mixture;

a heating device according to claim 1 provided in said collector for heating said air/fuel mixture; and

a current control element provided in said collector for controlling current to be supplied to said heating device.

8. (Currently amended) An air intake module for an internal combustion engine comprising:

a collector;

a throttle valve assembly connected to said collector;

an intake manifold connected with said collector for introducing intake air into each engine cylinder;

a fuel injector injecting fuel supplied into said intake manifold;
a heating device according to claim 1 provided in said fuel injector for heating said air/fuel mixture; and
a current control element provided in said fuel injector for controlling current to be supplied to said heating device.

9. (Currently amended) An air intake module for an internal combustion engine including an intake manifold having air intake passages arranged in parallel to a collector, comprising:

a mounting portion of a fuel injector injecting fuel to intake air supplied into said collector or said intake manifold, for forming an air/fuel mixture;

a mounting portion of a heating device according to claim 1 for heating the air/fuel mixture; and

a mounting portion of a current control element for controlling current of said heating device.

10. (Original) An air intake module for an internal combustion engine including an intake manifold having air intake passages arranged in parallel to a collector,

said collector or said intake manifold having a polygonal section perpendicular to a longitudinal direction with a plurality of planar surface in part.

11. (Original) A cold start device for an internal combustion engine comprising:

an idle air introducing pipe having an air inlet at upstream side of a throttle valve provided in an air intake passage;

a fuel injector for injecting fuel into intake air introduced into said idle air introducing pipe;

a heating chamber mixing the injected fuel and the intake air for forming an air/fuel mixture for heating the air/fuel mixture;

a heating element provided in said heating chamber for heating the air/fuel mixture; and

a current control element provided in said heating chamber for controlling current flowing through said heating element.

12. (Currently amended) An engine driving system branching an intake air to be supplied to a collector across an air adjusting valve into a plurality of intake air passage in an intake manifold for supplying into each engine cylinder, injecting fuel into intake air flow for driving the engine, the system comprising:

an idle air introducing pipe having an air inlet at upstream side of a throttle valve provided in an air intake passage;

a fuel injector for injecting fuel into intake air introduced into said idle air introducing pipe;

a heating chamber mixing the injected fuel and the intake air for forming an air/fuel mixture for heating the air/fuel mixture;

a heating ~~element~~ device according to claim 1 provided in said heating chamber for heating the air/fuel mixture; and

a current control element provided in said heating chamber for controlling current flowing through said heating element.

13. (Currently amended) An engine driving system branching an intake air to be supplied to a collector across an air adjusting valve into a plurality of intake air passage in an intake manifold for supplying into each engine cylinder, injecting fuel into intake air flow for driving the engine, and detecting oxygen concentration in an exhaust gas by means of an oxygen sensor, the system comprising:

an idle air introducing pipe having an air inlet at upstream side of a throttle valve provided in an air intake passage;

a fuel injector for injecting fuel into intake air introduced into said idle air introducing pipe;

a heating chamber mixing the injected fuel and the intake air for forming an air/fuel mixture for heating the air/fuel mixture;

a first heating ~~element~~ device according to claim 1 provided in said heating chamber for heating the air/fuel mixture;

a first current control element provided in said heating chamber for controlling current flowing through said heating ~~element~~ device;

a second heating device according to claim 1 provided in said oxygen sensor for heating a sensor element in said oxygen sensor; and

a second current control element provided in said oxygen sensor for controlling current to be supplied to said second heating device.

14. (Currently amended) A drive method for an engine branching an intake air to be supplied to a collector across an air adjusting valve into a plurality of intake air passage in an intake manifold for supplying into each engine cylinder, injecting fuel into intake air flow for driving the engine, and detecting oxygen concentration in an exhaust gas by means of an oxygen sensor, the method for driving the engine in cold start condition, comprising steps of:

injecting fuel into an air flow to be supplied to said collector for forming an air/fuel mixture;

heating said air/fuel mixture by said heating device according to claim 1 within said collector;

introducing heated air/fuel mixture into each engine cylinder of the engine; and

detecting oxygen concentration in the exhaust gas with heating said oxygen sensor.

15. (Currently amended) An engine driving system branching an intake air to be supplied to a collector across an air adjusting valve into a plurality of intake air passage in an intake manifold for supplying into each engine cylinder, injecting fuel into intake air flow for driving the engine, the system being active at cold starting of the engine, comprising:

at least one fuel injector provided in said collector for injecting fuel into said collector for forming an air/fuel mixture; and

a heating device according to claim 1 provided in said collector for heating said air/fuel mixture within said collector.

16. (Currently amended) An engine driving system branching an intake air to be supplied to a collector across an air adjusting valve into a plurality of intake air passage in an intake manifold for supplying into each engine cylinder, injecting fuel into intake air flow for driving the engine, the system being active at cold starting of the engine, comprising:

at least one fuel injector provided in said collector for injecting fuel into said collector for forming an air/fuel mixture;

a heating device according to claim 1 provided in said collector for heating said air/fuel mixture within said collector; and

a current control element provided in said collector for controlling current to be supplied to said heating device.

17. (Currently amended) An engine driving system branching an intake air to be supplied to a collector across an air adjusting valve into a plurality of intake air passage in an intake manifold for supplying into each engine cylinder, injecting fuel into intake air flow for driving the engine, and detecting oxygen concentration in an exhaust gas by means of an oxygen sensor, the system being active at cold starting of the engine, comprising:

at least one fuel injector provided in said collector for injecting fuel into said collector for forming an air/fuel mixture;

a first heating device according to claim 1 provided in said collector for heating said air/fuel mixture within said collector; and

a first current control element provided in said collector for controlling current to be supplied to said heating device;

a second heating device according to claim 1 provided in said oxygen sensor for heating a sensor element in said oxygen sensor; and

a second current control element provided in said oxygen sensor for controlling current to be supplied to said second heating device.

18. (Currently amended) An air intake module for an internal combustion engine comprising:

a collector;

a throttle valve assembly connected to said collector;

an intake manifold connected with said collector for introducing intake air into each engine cylinder;

a fuel injector injecting fuel supplied into said intake manifold;

a heat conductive body defining a passage for said air/fuel mixture;

a heating device according to claim 1 thermally coupled with said heat conductive body and generating heat to be transferred to said heat conductive body; and

a current control element for controlling current to be supplied to said heating device and thermally coupled with said heat conductive body for transferring heat generated therein to said heat conductive body.